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## CORRESPONDENCE.

*To the Editor of the American Naturalist:*

SIR: In his article in the May *Naturalist* on the "Structure and Classification of the Tremataspida," Dr. William Patten returns again to the question of the origin of the vertebrates from a supposed arthropod ancestor. It will be remembered that in two earlier papers<sup>1</sup> he compared the sutures and other markings on the head shield of trilobites with those on the dermal armor of *Pterichthys* and *Bothriolepis*; and we are confident that paleontologists will dissent as strongly from his latest as they did from his earlier conclusions that ostracoderms and arthropods are genetically related. The view expressed by him about eight years ago, that the three-layered dermal skeleton of ostracoderms is a modification of that in arthropods similar to *Limulus*, also lacks confirmation from other sources. His present procedure, however, is of the boldest; for on the startling assumption that ostracoderms were animals having *many pairs of jointed appendages*,—on merely a suspicion that this was true,—he finds it necessary to "create for them a new class, one that shall occupy a position between the true vertebrates and arthropods, and unite these two great groups into one compact phylum."

His account of the habits, development, and even some of the morphological characters of these "arthropod-like animals" is of such extremely speculative nature that few can hope to read with him the unwritten records of the past. For if it be not by intuition, how else can one know that ostracoderms originally progressed "through the soft mud on the bottom of shallow water with the usual position of dorsal and ventral sides reversed"; that after leaving the bottom they righted themselves into the true vertebrate position; and that this acrobatic performance was accompanied by a migration of the eyes from the haemal to the neural surface of the body? Or in what antediluvian aquarium, we wonder, was the locomotion of *Eurypterus* observed to be "by brief, spasmodic excursions"? And what authority have we for supposing that the "hypostomeal eyes of trilobites" (Lindström) were in the slightest

<sup>1</sup> *Quart. Journ. Micr. Sci.*, vol. xxxi (1890), pp. 359-365; *Anat. Anzeiger*, vol. ix (1894), pp. 429-438.

sense visual organs, or, in fact, anything but mere muscular impressions?

But these are trite criticisms in comparison with what might be said respecting Patten's remarkable declaration that ostracoderms possessed many pairs of jointed appendages. To refute this is to nullify the author's sole new claim that these creatures are "genetically related to arthropods, or that, through changes in structure and function, one type has been derived from the other"; for all other of the well-known resemblances may be explained as due to mimicry, or to incidental parallelism dependent on environment.

We have already characterized this assertion of Patten's as a surmise; we will go further, and say that it is not only an unproved hypothesis, but one that is absolutely unsupported by any specimens that have yet been described. If examples of *Cephalaspis* have been found which display "a fringe of 25 to 30 pairs of jointed and movable appendages along the ventral margin of the trunk," the present reviewer for one will confess that he has never seen nor heard of them. As for "Lindström's important discovery of an appendage in *Cyathaspis*," this detached and unjointed fragment is probably to be interpreted as a spine or cornu. But Professor Patten does not stop here: he points to a series of marginal openings in the shield of *Pteraspis*, *Cyathaspis*, and *Tremataspis*, commonly regarded as branchial, and declares that they "must" have served for the attachment of appendages. He surmises that in *Tremataspis* the latter "decreased in size from before backwards, and were possibly too delicate to be well preserved in a fossil condition." Fearful lest our rude touch should annihilate these frail conjectural organs, we will simply refer those interested to Dr. Traquair's comparison of *Tremataspis* with *Birkenia*, in which the branchial openings (commonly so-called) are disposed relatively as in the skate and shark.<sup>1</sup> A comparison, also, of the anterior ventral plates of *Tremataspis* with the very similar ones of *Drepanaspis*, in our opinion would have been far more instructive than our esteemed friend's attempt to homologize certain of them with the jaws of an arthropod.

The position of the mouth in *Tremataspis* we shall believe, until the contrary is proved, to have been correctly determined by Rohon, who places it immediately behind the rim of the head-shield, as in other ostracoderms where the oral plates are satisfactorily known. Patten, however, basing his conclusions on the solitary example studied by Rohon, challenges the latter's interpretation, and would

<sup>1</sup> *Trans. Roy. Soc. Edinb.*, vol. xxxix (1899), pt. iii, p. 859.

have us suppose that one of the plates of the ventral armor functioned as oral. The author's employment of such generic and family misappellations as "Tolypaspis" and "Pterichthydaë" respectively, is contrary to all recognized principles of nomenclature.

That part of Professor Patten's article which embodies a redescription of the dorsal and ventral shields of Tremataspis, based on four or five unusually perfect specimens from the Isle of Oesel, possesses great merit, and paleontologists should be truly grateful to him for having increased our knowledge of this primitive chordate in several important respects. The more extensive memoir on the same subject which is promised will be awaited with great interest; and further enlightenment with regard to the gill openings and position of the mouth in ostracoderms will be particularly welcome.

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